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EARTH OBSERVING SYSTEM (Eos) ADVANCED ALTIMETRY

by

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In the post-TOPEX era, satellite radar altimeters will be developed with the capability of measuring the earth's surface topography over a wide swath of coverage, rather than just at the satellite's nadir. The technological issues inherent in the off-nadir measurements are being studied through RTOP 161-10-06. An Aircraft Multibeam Radar Altimeter is being developed under this RTOP, and it is described in another report in this volume entitled "Advanced Altimetry (RTOP 161-10-06)." In parallel, the identification of potential spacecraft flight missions in the future has also been pursued. The best opportunity was found to be the Earth Observing System (Eos). Through agency-level program initiatives such as Mission to Planet Earth, Eos has become the primary platform of opportunity for the earth sciences in the 1990's, and the recent Announcement of Opportunity (No. OSSA-1-88, January 19, 1988) is convenient and timely. The progress in RTOP 161-10-06 makes an Eos proposal at this time possible.

A joint proposal is now in preparation. Participants in this activity are from the GSFC, the Jet Propulsion Laboratory, and the Federal Republic of Germany. The participants have mutually agreed to this collaborative effort because of the interdisciplinary nature of Eos. It is felt that an instrument system

that has a broad appeal to the earth sciences community stands a much better chance of being selected as an Eos instrument. Consequently, the Topography and Rain Radar Imager (TARRI) will be proposed as a system that has the capability to profile the Earth's topography regardless of the surface type. The horizontal and height resolutions of interest are obviously significantly different over land, ice, and water; but, the use of radar to provide an all-weather observation capability is applicable to the whole earth.

It is proposed that the instrument development responsibilities will be shared by the participants. The Land Mode will use a scanning beam produced by a 12 m x 1 m phased array to measure the slant range in the cross-track direction over a 20 km swath. The Ocean Mode will use a "parked" beam from the phased array as the transmitter and two parabolic dishes separated by a fixed boom as an interferometric receiver. The two-dish interferometric altimeter approach has been described in the literature by Bush, et al. ("An Analysis of a Satellite Multibeam Altimeter," Marine Geodesy, Vol. 8, Nos. 1-4, 1984, pp. 345-384). Both modes operate at a frequency of 36 GHz. The Ocean Mode dishes have multiple feed horns boresighted in pairs; at present, a maximum number of five illuminated spots on the surface is envisioned. At a spacing of 25 km, this will yield topographic information over a total swath width of 100 km.

The scientific guidance for the design and development of this

instrument and the eventual scientific utilization of the data produced by the TARRI will be provided by seven science teams. All are responsible to the Principal Investigator and two Deputy Investigators. The teams are formed around scientific disciplines and are titled: Geology/Geophysics, Hydrology/Rain, Oceanography, Ice/Snow, Geodesy/Orbit/Attitude, Cartography, and Surface Properties/Techniques.